

Design of Remote Control Juvenile Healthy Smart Pillow

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Abstract

High-quality modern life results in many unique diseases of modern people, cervical spondylosis, sleep disorders. Adolescents lack of sleep have a negative impact on the students themselves. Not only it will reduce the body resistance, prone to a variety of diseases, but also it makes learning when the spirit is not concentrated, attention is decreased, thus affecting the learning state. Long-term lack of sleep will lead to psychological problems, a potential threat is formed to the physical and mental health of young people. To this end, based on WeChat platform, a young people's health intelligence pillow is designed, it can be remotely controlled.

Keywords: Sleep Quality, Pillow Comfort, Automatic lift. WeChat operating platform, Remote control

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1. Introduction

People have always attached importance to the function of pillows, and it now has become a pillow manufacturing and consumption power, while the type of pillow, style is constantly evolving. Pillow function is to sleep when the pad head. According to archaeological data, it shows that the oldest pillow is a natural stone, later for the initial processing of the stones, and it is gradually expanded to the use of other materials, such as cloth pillow, wooden pillow, jade pillow, copper pillow, bamboo pillow, crystal pillow, etc., there are different materials, versatile, it was reflecting the material life at that time. In ancient China, there were the largest number of ceramic pillows. Like other household ceramics, it is produced with the development of porcelain craft technology [1, 2].

Modern people use cloth pillows, the materials of the general pillows are kapok, feather, aloe, scattered foam, pork sticks, buckwheat skin composition, they are soft and comfortable. In the country, large malls, hospitals, online have a similar product health pillow, this pillow is based on the combination of traditional Chinese medicine, it is more helpful on some difficult complications of adjuvant treatment. Beijing Austrian Kejian Technology Co., Ltd., developed the "palace pillow" series, such as: jasmine pillow, mulberry pillow, worry grass pillow, wick grass pillow, hibiscus flower pillow, herbal flower pillow, honeysuckle pillow, The central nervous system is regulated, and they clear the meridians, remove the depression, improve immunity, soothe the nerves eye-catching, relieve fatigue, natural herbs are used to relieve headache, dizziness and other head discomfort, blood pressure is regulated, blood circulation is promoted, it effectively improves the brain blood supply and other functions [3, 4].

Self-made cervical traction swing massage pillow treats cervical spondylosis clinically, cervical traction, swing, massage treatment pillow is designed based on the cervical shape, height of the best crowd, it is to maintain the cervical curvature, the internal and external balance of the cervical spine plays an important role [5, 6].

Multi-functional snoring massage pillow design is based on the TRIZ theory, the single-chip, motor, mechanical devices, ergonomic devices are integrated and it is the overall integration, the change in people sleeping position of the snoring is achieved with programming instructions, mechanical rotation handle and a series of automatic actions are used to reduce the manpower and to change the sleeping position, of the implementation of the passage of time is for habitually snoring people, it can effectively be controlled, but also it reduces that the snoring crowd in sleep brings trouble to other people [7, 8].

Intelligent hypnotic pillow is designed and implemented, design of multi-functional intelligent hypnotism pillow can play hypnotic music, massage, health care, intelligent sleep state detection, memo recording, alarm reminders. The intelligent hypnotic pillow is designed by playing hypnotic music, massage, the concept of rapid sleep is achieved to the user; system with a touch switch counter intelligent detection of sleep, the user head is determined to move several times, automatic playback of hypnotic music is achieved, it will play health hypnosis effect [9].

There have been travel car with kneading massage,, modern people often drive far away, due to long driving, car, easy to produce neck, shoulder, waist fatigue. Guangzhou Shi-resistant Electronic Technology Co., Ltd. produces the car with a kneading massage pillow, it is designed according to the body in the car seat, and kneading massage people is designed through the internal two kneading massage head [10].

At present, all countries in the world have begun to pay attention to the construction of Internet of Things, and a lot of technology research and development and application work have been done. The new Internet of Things industry has become an important new industry to promote world economic growth [11]. The Internet of Things industry is an important part of China's current economic development, But also a modern industrial system is built, the core competitiveness of the industry is enhanced and the sustainable economic and social development of the inevitable choice is achieved. Intelligent home that ordinary residential through the wiring will be residential electrical appliances, security alarm equipment, it is connected to the controller and the network, through the network, the user remotely control and manage residential and monitor the housing situation, so that the residential environment maintain a comfortable and coordinated, a smart home environment suitable is provided for the owner life, study and work. The concept of smart home is in line with the current people, it meets the high demand of the residential environment.

2. Smart Pillow Frame

The young people sleep smart pillow mainly include mobile phone WeChat subsystem, server and single-chip three parts. In this design, the user subscribes simply to the designated micro-signal, you can achieve the control of the smart pillow and sleep in the sleep environment. The system uses the processor for the NodeMCU hardware platform, we develop a remote silent wake-up, automatic lift device, sleep environment detection, dream recording, music playback of these five functions. The PHP + MySQL combination are used in the development of the system WeChat, and the Arduino program is prepared in the Arduino IDE development environment, through the WeChat common test platform and the communication between the server, single-chip and data are exchanged between the database, Commands are sent to control the microcontroller and to operate pillow, and real-time feedback information will be obtained from the microcontroller, it is displayed to the WeChat terminal up. The connection diagram of the system is shown in Figure 1.

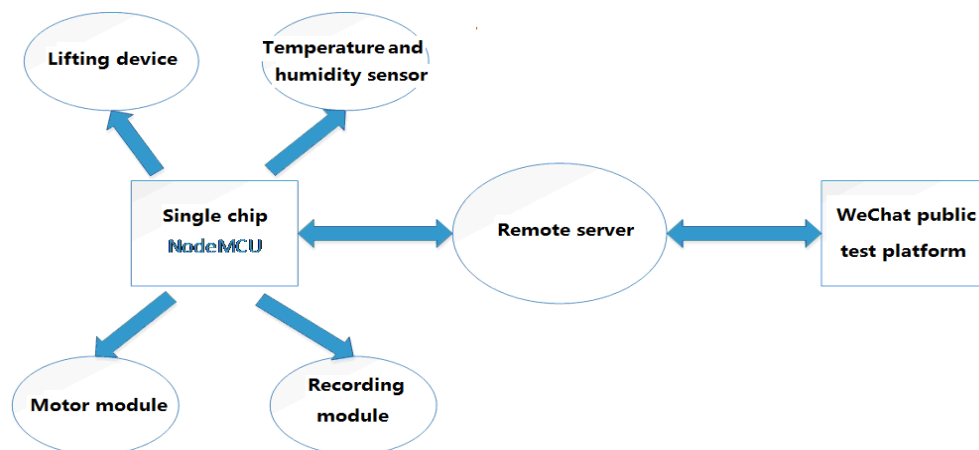


Figure 1. Block diagram of youth sleep health intelligence pillow

A pillow is designed to improve the quality of sleep in young people, Related research is as follows:

(1) intelligent control system. With the development of Internet of things technology, intelligent home applications are more extensive. We plan to design and implement an intelligent control system based on the micro-public platform. The system includes mobile phone micro-terminal, server and microcontroller control of three parts. Users only need to subscribe to the specified micro-signal, the relevant instructions are entered to control the various modules of the terminal and it can receive feedback data from the terminal at any time.

(2) Automatic lift pillow. if poor choice of pillow, it impact directly on sleep. Especially when people sleep one side, the pillow is too low, there is not pillow or pillow is too soft, these will cause neck and shoulder pain. Experts believe that, regardless of sleep, side sleep, the neck normal physiological curvature of the pillow is best. So a scientific and reasonable pillow should have the following three points: First, there is a suitable height, there is supine height in supine, there is the fit height in lateral side, and the neck is high, the head is low. Second, there is a reasonable curvature, pillow fit the head and neck natural physiological curve, so that the head and neck have a comprehensive natural support. Third, there must be comfortable soft and hard (elastic), elastic is too small, feeling is too hard; elasticity is too large, the reverse force increases, increased pressure.

(3) Silent wake-up function is designed. The micro-vibration is used instead of alarm clock function, and you can use the WeChat to set up their own time and to wake up young people, or micro-terminal remote control of the pillow is used to achieve a silent wake-up, to avoid noisy, it can be more effective and more practical wake-up role.

(4) Automatic lifting device is designed. the automatic lifting device should meet the side height of the shoulder width, the pressure sensors are used to determine the user's sleeping position, no matter what kind of sleeping position, it can make the pillow fit the body's sleep curve, it effectively alleviate the neck pressure, stiffening is prevented. And the lifting device is repeatedly raised and lowered, it can play the role of pulling up the neck muscles and to restore the curve of the cervical spine, massage device is embedded in the middle of the lifting device, it can produce vibration, by adjusting the vibration frequency, it can play massage, the pain of the neck is eased.

(5) Design of sleep environment detection function. the pillow temperature and humidity sensors are used to monitor the environmental quality of the pillow, real-time environmental data is upload to the WeChat, and analysis of data is provided to users with good advice. The signal generator in the pillow can automatically control the air conditioning, fans and other home appliances, the indoor temperature and humidity are adjusted, so that a comfortable sleep environment is maintained in the indoor time.

(6) Design of music playback and dream recording function. The pillow has a built-in music player and recording module, that light music is automatically played when the user enters deep sleep, and it can clearly record sleep or snoring when sleeping.

(7) We make full use of the advantages of WeChat public platform. The operating platform is embedded in the WeChat client, the remote control pillow is achieved in the WeChat platform, and real-time environmental data is queried. The actual application of the simulation is shown in Figure 2.



Figure 2. Practical application of the simulation

3. Intelligent Pillow Technology Design

3.1. Network Server Build

A network server is built, and the database is inserted in the server to complete the micro-terminal and the server connection and micro-mail and database interaction, the single-chip integrated WIFI module is used to complete the communication with the server, and data are exchanged with the database, and the server is used as bridge, in order to control SCM module through the operation of micro-terminal, it is a complete intelligent control system, micro-terminal can also be displayed at any time by the feedback data. As is shown in Figure 3.

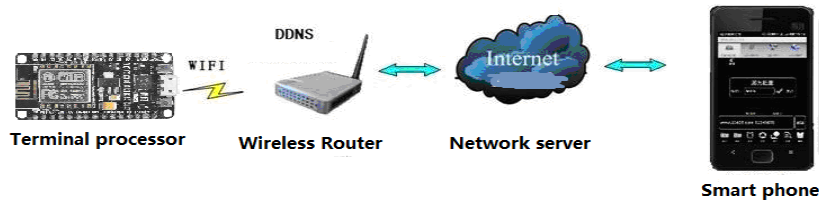


Figure 3. Intelligent control system

Server to build: the micro-public platform is used for the development of the server platform, it requires the support of the server, developers must first build a public network server, we chose to apply for Sina cloud server. Open <http://sae.sina.com.cn/> website, login can be used after the real name authentication .

WeChat or Arduino microcontroller data uploaded to the database through the network, the other end downloads the appropriate data through the network. The temperature and humidity and other data are stored on the database, the first MySQL database initialization is done, the name, user name and password are set, these can not be modified in the creation of shared MYSQL database, the database is managed, MySQL is opened through phpMyAdmin graphical management tools, Three fields are built with number 3 data table name, they are respectively, switch, humdsensor and tempsensor, in addition to "data table name" is different, other parameters are the same. After the setup is completed, a record is inserted with ID 1 in each data table, and the value of data or state is not empty. At this point, the database initialization is complete.

In addition, the server side needs to complete the two aspects of the code design, on the one hand to connect WeChat, on the other hand to connect Arduino microcontroller, these are written in PHP.

The connect WeChat code can refer to the WeChat which is provided by the official website of the sample code. The code for connecting microcodes is designed as follows:

- 1) To determine whether the first access, if yes, then verify, or no verification.
- 2) To determine the type of the received message, if the "subscribe" type, then the message to the user, that is, when the user concerned about the public when the reply message.
- 3) The switch() structure is used to determine the contents of the received text message. If the "lights", then update the MySQL database switch form ID 1 record time, the value of the record state is updated to 1, and the user to reply to the completion of the prompt; if the "off", then update MySQL database switch form ID is 1 record time, the value of the record state is updated to 0, and the user to return to the completion of the prompts; if the "temperature", from the MySQL database tempsensor form ID 1 record To get the value of data, and the value of the return to the user; if the "humidity", from the MySQL database humdsensor form ID 1 record to get the value of data, and the value back to the user; if not the four The situation, then the user reply "does not support the directive."

Arduino microcontroller is as an HTTP client, HTTP requests are sent to the server through the GET way, server-side connection Arduino microcontroller code use GET way to obtain temperature and humidity, and return to the Arduino switch status.

- 4) The data "humddata" and "tempdata" are obtained by GET, to determine whether they are empty and "token" is "doubleq", if not, then the "Permission Denied" is output ; if so,

the MySQL database is connected, the ID value of the record is obtained in the the switch form is 1 and it is output.

5) Data "humddata" and "tempdata" will be obtained through the GET way, respectively, "humdsensor" and "tempsensor" are updated to ID 1 record the data of the MySQL database form.

3.2. Lifting Device Control

The automatic lifting device and pressure sensor are added in the pillow, because people sleep supine and side, the head pressure is changing on the pillow, according to changes in pressure, the user's sleeping position can be determined, automatic lift device will be followed with the user sleeping position automatically adjust the height of the pillow, when the user lying down, the pillow will slow down, when the user side sleep, the pillow will slowly increase, as long as the adjustment to the appropriate height, sleep process will not be damaged, and thus it is away from cervical spondylosis.

Through the steering gear control of the lifting device, and Arduino microcontroller control technology is used, when the user from lying sleep to side sleep, the pillow will naturally raise the cervical spine and spine in the same line to prevent the pillow! When the user from the side sleep to lying sleep, the pillow will automatically lower, so that the user's cervical spine maintain the most relaxed posture, cervical anti-arch is prevented. When the user's mobile phone is set for the traction mode, the lifting device will repeatedly increase and decrease, it pulls up the neck muscles, cervical curve is restored. The pressure of the neck can be effectively relieved through the automatic lifting device, it is more conducive to smooth breathing, adequate oxygen is provided to the brain, the incidence of snoring is reduced, thereby the quality of youth sleep is improved. As are shown in Figure 4 and Figure 5.

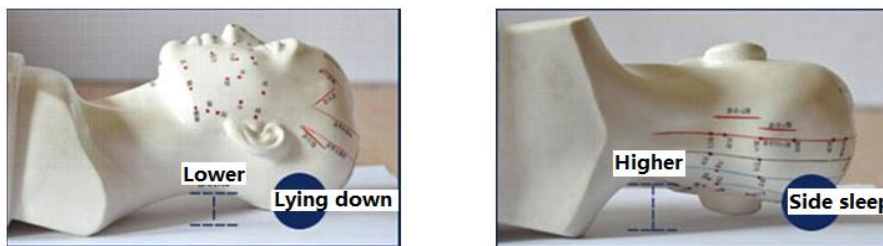


Figure 4. Height required for supine and side sleep (Lying down: Cervical need to support the lower height; Side sleep: Cervical need higher support height)

	High pillow	Low pillow	Automatic adjustment
Supine			
Lateral			
result			

Figure 5. The difference between high and low pillow and automatic adjustment pillows

3.3. Micro-public Platform to Build

Open <https://mp.weixin.qq.com>, a micro-public platform user is become, the developer mode is enabled. The use of the developer mode requires the support of the server, the user needs to build the server. After building a server environment developers, it need to follow the steps to enter the micro-public platform development:

1) Fill in the server configuration. After logging in to the public website, the developer mode is enabled, click the "Modify configuration" option, fill in the developer domain name, Token and EncodingAESKey. Where URL is used for data transfer between the server and the microsecond server that the developer requests. The Token is set by the developer, and it must be the same as the Token defined in the server script code and used for authentication access to the public address. EncodingAESKey is generated randomly, and it can be used for message encryption.

2) Verify the message from the WeChat server. After the developer submits the configuration, the microsecond server sends a GET request to the user to fill in the public network server address. The developer verifies the request by checking the signature.

3) According to the interface document to achieve business logic. Verify that the server domain name is successful.

At present, the WeChat has been applied for a public test platform, and the the user interface has been designed, in this operating platform, thrtr are voice recognition, manual input information, function menu click, web query and several other modes of operation, and the help Menu is joined, it gives users a more simple and convenient operation experience. As are shown in Figure 6, it is WeChat operating platform.

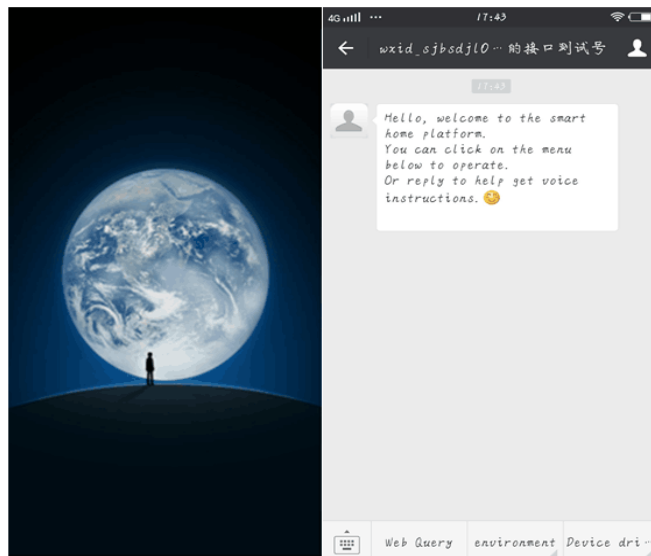


Figure 6. WeChat operating platform

3.4. Arduino Single Chip Computer Program Design

The work of uploading temperature and humidity and downloading light status are completed in Arduino MCU end. The connection between the microcontroller and the server is through the HTTP protocol, as the HTTP client microcontroller, it use GET way to access the server and upload the temperature and humidity form, the server returns to the light state, the microcontroller control the light according to the light state. The light control flow chart is shown in Figure 7. the upload temperature and humidity flow chart are shown in Figure 8.

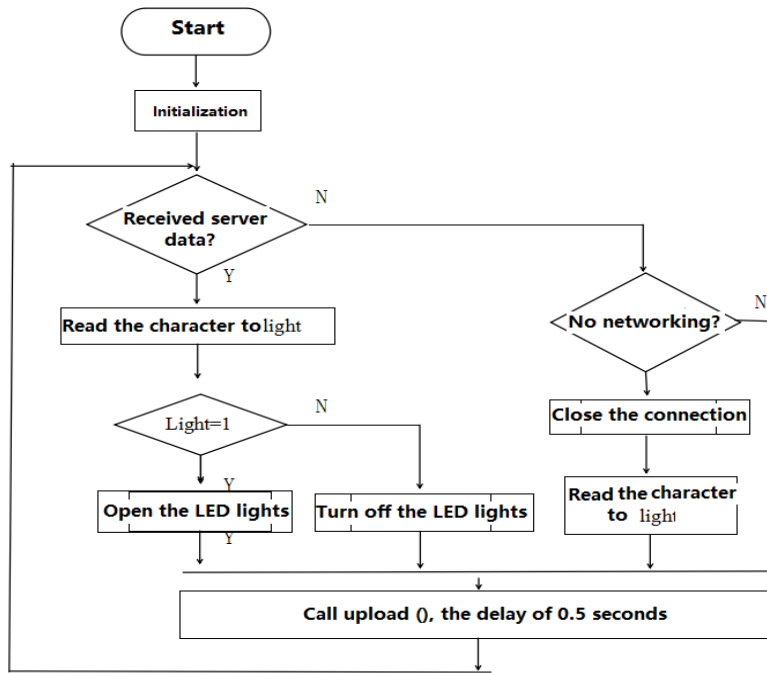


Figure 7. Lighting control flow chart

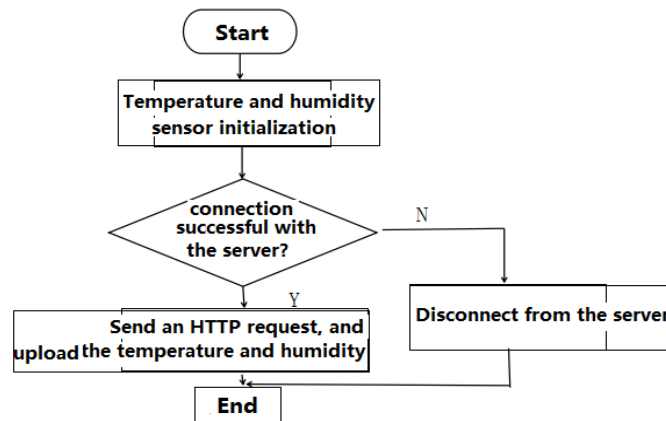


Figure 8. Upload temperature and humidity flow chart

3. System Test

The phone is used to pay attention to WeChat public number, the WeChat public number is observed by sending the relevant instructions, whether it can achieve the desired function. Send "temperature", "humidity" and other messages to the microcredit public number. As expected, the public number can automatically reply "has been opened for you !!", "has been closed for you !!", "the temperature of your inquiry room is tempsensor form °C for the database .", "You check the room humidity is Humdsensor form% RH for the database.", and "it do not support this command.". Please enter 'turn on' or 'turn off' the lights to control the light or enter the 'temperature' humidity check room real time temperature and humidity.", it Indicates that the system can work properly. WeChat interface is shown in Figure 9.



Figure 9. WeChat interface

We designed the smart pillow in kind as shown in Figure 10

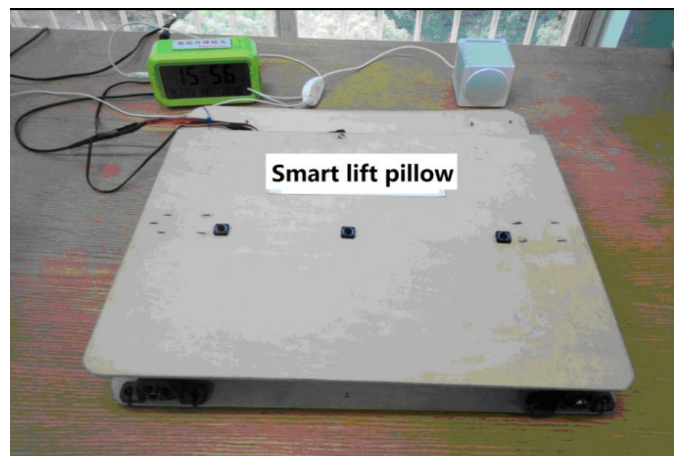


Figure 10. Intelligent pillow experimental device

4. Conclusion

This paper studies the design of remote control juvenile health smart pillow, it is composed of six functions: remote silent wakeup, automatic lift device, sleep environment detection, dream recording, music player and microphone terminal. Adolescent healthy sleep pillow main function is shown in Figure 11.

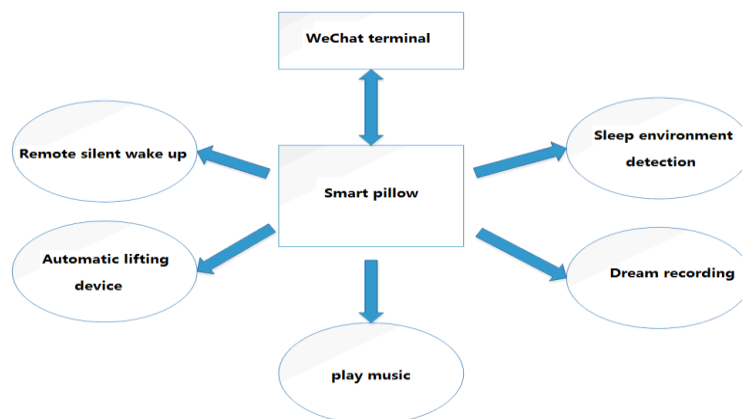


Figure 11. Adolescent Health Smart pillow sleep function chart

Design of young people sleep health smart pillow is for modern adolescents, due to learning pressure and other reasons, they are leading to decreased sleep quality, and most parents concern about the quality of sleep care, the collected information are for detailed management, youth sleep smart pillow main function is designed, the historical data of juvenile sleep quality is analyzed, the habit of adolescent sleep and sleep quality factors are summed up, and on the basis of a design, the quality of juvenile sleep pillows are improved to meet the parents real-time monitoring of children's sleep quality needs.

WeChat operating platform is developed. Traditional APP involves a large number of spy on the user's privacy behavior, and there is high cost in the development processes, there are long development cycle, most of the APP applications require users to download and install, it not only take up most of the memory of the phone, and the application process is cumbersome. The operating platform is embedded in micro-client, the user only need to simply scan the two-dimensional code, it can be easily concerned about, and it does not take up the phone's memory space. WeChat public number is relying on WeChat platform to run, by the WeChat of the restrictions and regulation, there is no spy on the privacy of users. WeChat is a huge social platform, the user can used own daily sleep quality analysis data sharing in the circle of friends, this feature makes the product in the promotion of a great advantage.

Automatic lifting device is designed. People often only notice the supine height of the neck and the height of the posterior brain is not the same, and there is a physiological curve, so the pillow is designed to have a high neck, low curvature of the brain shapes B type. This does increase the comfort of the pillow to some extent, avoiding some damage to the cervical spine, but this design only takes care of the needs of the supine, and it can not meet the needs of the side sleep, the majority of people will not sleep always to keep the same posture, they often supine and lateral alternately, the lying sleep only on a sleeping position of the pillow, it is over time, it will make the natural bending of the cervical spine to be changed, it appears oppression of nerve, oppression of blood vessels.

In view of our sleep often change sleeping position, really suitable is for human physiological characteristics of the pillow, it should be "a pillow, two kinds of height", that is the kind of "middle low, both sides of the high" double horizontal pillow. This design of the pillow, whether it is supine or side, the body's cervical spine will be in a gentle natural curvature of the state, the different sleeping position is avoided in the deformation of the cervical spine, it both increases the comfort of sleep, but also a comprehensive protection of the cervical spine is health, it can be in a few days to let people's cervical pain to ease.

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